



Moog Fernau Limited
Airport Executive Park, President Way
Luton, Bedfordshire LU2 9NY • United Kingdom
Telephone: +44 1582 483111 • Fax: +44 1582 484404
www.moog.com

May 28, 2019

Marlene Dortch, Secretary
Federal Communications Commission
445 Street, SW
Washington, DC 20554

via ECFS

Re: Written *ex parte* presentation: Amendment of the Commission's Rules to Promote Aviation Safety, WT Docket No. 19-140; Petition of Sierra Nevada Corporation for Amendment of the Commission's Rules to Allow for Enhanced Flight Vision Radar under Part 87, RM-11799

Dear Ms. Dortch:

Moog Inc. ("Moog") appreciates the opportunity to review the Commission's draft Notice of Proposed Rulemaking ("Draft NPRM") in the above-referenced matters made available to the public on May 16, 2019, as it pertains to the consideration of rules to enable the deployment of Enhanced Flight Vision Systems ("EFVS") in the United States in the 92.0-95.5 GHz range (the "94 GHz Band"). FCC-CIRC1903, ¶¶ 9-13. Moog takes this opportunity, as a party developing and deploying systems in the United States and abroad today to enhance the safety of aviation utilizing some of the same spectrum under consideration, to offer several views on and propose slight modifications to the *Draft NPRM*. Moog commends the Commission for proposing to initiate a proceeding to consider multiple ways to use spectrum in new ways to improve the efficiency and safety of aviation operations.

Moog, headquartered in East Aurora, NY, is a worldwide designer, manufacturer, and integrator of precision control components and systems.¹ As explained in an earlier filing with the Commission concerning a proposal to use the 94 GHz Band for aviation and maritime data links,² Moog offers a variety of airport and airfield solutions including airport runway surveillance, distance measuring equipment, direction finding, and tactical air navigations, including the Tarsier Automatic Runway Foreign Object Debris ("FOD") Detection System ("Tarsier"), the world's first automatic runway FOD detection and warning system. Tarsier uses millimeter wave radars centered at 94.32 GHz with a sweep of +/- 0.72 gigahertz, *i.e.*, use of the range 93.60-95.04 GHz, to continuously scan runway surfaces and pinpoint debris location with precise range and bearing in a wide range of conditions in low light conditions especially in complete darkness and adverse weather including snow, sandstorms and dense fog. FOD, if undetected and unaddressed, can potentially be debilitating to jet engines and otherwise dangerous to aviation operations, endangering passengers and crew as well as equipment. As such, Moog has an interest in any proposals to

¹ Moog's high-performance systems control military and commercial aircraft, satellites and space vehicles, launch vehicles, missiles, automated industrial machinery, marine and medical equipment.

² See Reply Comments of Moog, Inc., RM-11824 and RM-11825 (filed Mar. 26, 2019) ("Moog Reply Comments")



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introduce new systems in the 94 GHz radiolocation band which could be incompatible with Tarsier system deployments and create potential dangers in locations where Tarsier may be deployed

Tarsier was first inaugurated at Vancouver, Canada's airport in 2006. The Federal Aviation Administration ("FAA") has reviewed the Tarsier system which, in part, has formed the basis for the FAA's development of FOD-related standards for systems operating in the 92-100 GHz Bands.³ Most recently, Tarsier is now being deployed in the United States at the United States Marine Corps Air Station, in Yuma, Arizona, and Moog anticipates commencement of operation in the second half of the year. The 2018 contract also includes an option for an installation of the Tarsier system at the Corps's Air Station at Cherry Point, North Carolina, and additional locations are under consideration. Moog is also evaluating the introduction of Tarsier FOD systems at non-Federal government airports. Accordingly, given the imminent commencement of 94 GHz FOD operations in this country, the *Draft NPRM*, to the extent that it implies that FOD at 94 GHz would be a "contemplated service," *see Draft NPRM*, ¶ 12 and n. 22, should be clarified.

Moog is desirous of exploring and finding solutions with proposed co- and adjacent-band systems to enable compatible operation wherever feasible. While Moog expects that its FOD system will be compatible with many other 94 GHz operations, in part because of the

³ Tarsier served as a basis for stringent radar criteria reflected in FAA FOD detection standards. *See, e.g., Edwin E. Herricks, Elizabeth Woodworth, Sid Majumdar, James Patterson Jr., DOT/FAA/AR-10/33, Performance Assessment of a Radar-based Foreign Object Detection System (Feb. 1, 2011) available at <http://www.tc.faa.gov/its/worldpac/techrpt/ar1033.pdf>; U.S. Dep't of Transp., Fed. Aviation Admin., AC No. 150/5220-24, Airport Foreign Object Debris (FOD) Detection Equipment (Sept. 30, 2009), available at https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.information/documentNumber/150_5220-24; U.S. Dep't of Transp., Fed. Aviation Admin., AC No. 150/5210-24, Airport Foreign Object Debris (FOD) Management (Sept. 30, 2010), available at https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/documentNumber/150_5210-24.* The 2009 document is specifically referenced in recent U.S. contributions to the ITU WP 5B proceedings concerning FOD operations in the 92-100 GHz range. *See USWP5B23-05, WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW RECOMMENDATION ITU-R M.[RAD-92-100GHZ]: Technical and Operational Characteristics of Radiolocation Systems Operating in the Frequency Range 92-100 GHz and Radionavigation Systems Operating in the Frequency Range 95-100 GHz (January 30, 2019). See also Draft NPRM n. 22.*



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limited locations where Tarsier will be deployed (i.e., at airfields) and because of the use of down-tilted antennas, i.e., oriented toward the surface of the runways, confirming compatibility requires sufficient information about other systems. The Sierra Nevada Corporation ("Sierra Nevada") petition for rulemaking in RM-11799 does not contain sufficient information for the Commission and others to ascertain the likelihood of compatible operations with EFVS. Moog is pleased that the *Draft NPRM* seeks input on "whether Enhanced Flight Vision System radars are compatible" with other services in the 94 GHz Band, *see id.*, but suggests that the Commission also add the following test, or the equivalent at the end of paragraph 12:

"To that end, we ask that proponents of EFVS provide detailed information on operational characteristics to allow the Commission and other interested parties to assess compatibility, including EIRP, under what conditions operation of the EFVS will be triggered, the duration of operation, and how frequencies will be selected, and consider the feasibility of mitigation measures. In its Petition, for example, we note that Sierra Nevada explains that the frequency use is adjustable in 60 megahertz steps but does not indicate under what conditions its EFVS radars would utilize the entire 92.0-95.5 GHz range or what the bandwidth requirement would be for a given step."

In connection with the same, and further investigation of the issue supported by sufficient detail concerning EFVS, Moog requests that the Commission reserve judgment whether it can "agree that the potential for interference to other receivers appears minimal," *see id.* ¶ 12, and remove or qualify language to that effect from the *Draft NPRM*.

Finally, Moog respectfully suggests that the *Draft NPRM* request comment on other measures to supplement instrument landing systems in limited visibility environments, including the operation of EFVS in other frequency bands. The *Draft NPRM* summarizes Sierra Nevada's statements as to why its systems are superior to existing infrared technology. But the potential of all existing and imminent other solutions to aid pilots should be taken into account when considering making new spectrum available to EFVS. The operational capabilities of such other systems, for example, would likely help guide potential future regulations that ensures operation of EFVS radars in the 94 GHz band, if they are in fact permitted, that maximizes spectrum utilization and enhances compatibility with other systems.



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Pursuant to Section 1.1206(b) of the Commission's rules, this letter is being filed electronically.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Paul Revell".

Paul Revell
Managing Director

Attachment

cc: Chairman Ajit Pai
Commissioner Michael O'Reilly
Commissioner Jessica Rosenworcel
Commissioner Brendan Carr
Commissioner Geoffrey Starks
Aaron Goldberger
Erin McGrath
Umair Javed
Will Adams
William Davenport